INTEGRATED HANDHELD DATA PROCESSING DEVICE HAVING A SLIDING FORM FACTOR

FIELD OF THE INVENTION

The present claimed invention relates to the field of handheld data processing devices. More particularly, embodiments of the present claimed invention relate to an integrated handheld device having three components with a sliding configuration.

BACKGROUND ART

Over the years, many electronic instruments and devices and been sufficiently reduced in size to become portable, and in turn, small enough to be held and operated in the hand of the user. The advent of integrated circuits greatly increased the number of devices that could achieve portability and handheld status, as well as increasing the functionality of such devices.

Today, handheld data processing devices include computers, video displays, audio players and recorders, laboratory instruments, telephones and other communications devices. In many cases, multiple functions may be integrated into a single device such as in a telephone/audio player combination.

The data processing functions included in a handheld device may require a variety of input/output capabilities. Devices with audio signal processing capabilities require a microphone for input and/or a speaker for output. Tactile transducers such as keypads and touch panel displays are useful for general alphanumeric input to a wide variety of devices. Visual displays ranging from simple indicating lights to video displays capable of rendering a television broadcast may be found as the outputs on many handheld devices.

In addition to user input/output interfaces, devices may also have wireless transmitters and receivers. These wireless interfaces may use radio frequency, infrared, or visible portions of the electromagnetic spectrum.

The competing interests of increasing functionality and small size in handheld devices have led to compromises in the design of the fixed form factor packages that are used for most handheld devices. For example, devices such as calculators or personal digital assistants must allocate a fixed amount of available surface area to a display and a keypad.

Ergonomic constraints also play a key role in the design of fixed form factor handheld devices. The degree of miniaturization that can be applied to a keypad is typically limited by the size and dexterity of an average user's fingers. Likewise, the placement of a speaker and microphone for a telephone is limited by the mouth and ear separation of a typical user.

Fixed form factor handheld devices such have been supplemented by variable form factor devices having components connected by hinges. In general, hinges provide a more compact form factor for storage when closed, but the device is often not functional with the hinge in a closed position (e.g., a some handheld calculators).

Conventional placements of speakers, microphones, and keyboards (keypads) yielded larger PDA form factors and resulted in undesirable telephony experiences while also not addressing issues relating to an integrated display protection solution. Displays were left exposed and unprotected from debris and facial oils during phone usage. Many integrated keyboards are forced to fit within the width of a portrait-mode device, thus compromising ergonomics due to decreased key size and spacing. Further, earpiece to microphone separations were solely dictated by device size, whether too small or too large.

Thus, a need exists for an adjustable form factor for handheld devices that provides functionality in both extended and compact forms.

SUMMARY OF INVENTION

Accordingly, several embodiments of the present invention include structures that provide a handheld data processing device with functionality in a variety of forms. The input and output characteristics for the device are adjustable by the user through variations of the form factor of the handheld device.

A handheld data processing device having three functional components assembled in a sliding configuration is disclosed. A processor module is mechanically coupled to two sliding covers. The processor module houses circuits for performing the functions of data processing and may also include a display and input/output functionality. The two sliding covers provide protection for the processor module (including display screen) and may include input/output transducers such as a keypad, speaker or microphone. Embodiments of the handheld data processing device include a handheld computer, wireless telephone and handheld video display.

In an embodiment of the present invention, housed as a handheld computer, the display and processing functions are integrated within a display/processor module and two keypad sliders provide a keypad for input. The keypad sliders may slide in a plane parallel to the surface of the display and may be adjusted to shield or expose the display by sliding. One or both of the keypad sliders may include a transparent window that enables viewing of the display while in the closed position. In one embodiment, a "QWERTY" keypad with control and option keys is provided.

In another embodiment of the present invention, a wireless telephone, the display and processing functions are housed in a transceiver module and the two keypad sliders provide a keypad for input. One of the two keypad sliders houses a microphone and the other houses a speaker. The two sliders are capable of sliding independently of one another and allow for adjustment of the microphone and speaker separation distance. Additionally, one or more detent mechanisms may be provided to provide for setting a repeatable and stable microphone and speaker separation distance. In this embodiment, the speaker and microphone may be located on the side of the device that is opposite of the display.

The invention separates the traditional handheld computer component package into three distinct elements that reconfigure relative to each other through a sliding mechanism. The articulating left/right side element may house numerical dialer keys for telephony functionality, full QWERTY keyboard, and navigation/application keys on the front of the device and speaker and microphone on the rear of the device. The center, fixed element may house the display/PCB/battery, etc.

The left/right housing may slide over a majority of the display module in the closed position. Advantages to this articulation are:

- decreased overall length of the product for compact storage, one handed telephony usage, and/or keyboard input;